ADVANCED SUBSIDARY / ADVANCED GCE

BIOLOGY

ASSESSMENT UNIT BI 1

JUNE 2001

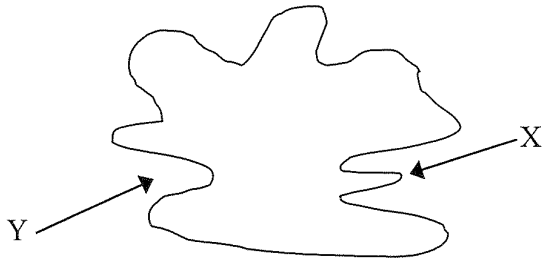
Question		Answers / Explanatory Notes	Marks Available
1	(a)	Is the movement of water from a dilute solution to a strong solution across a partially permeable membrane? / Is the movement of water from a region of high / less negative water potential to a region of low / more negative water potential across a partially permeable membrane? / Is the movement of water molecules across a partially permeable membrane from a region of high water concentration to a region of lower water concentration / down a concentration gradient	2
	(b)	Turgid	1
	(c)	Plasmolysed	1
	(d)	Requires energy / ATP / involves other substances apart from water / against a concentration gradient / needs a carrier	1
	(e)	Stops active transport / ATP production / is a respiratory inhibitor / inhibits. (not: slows it down)	1
			[6]

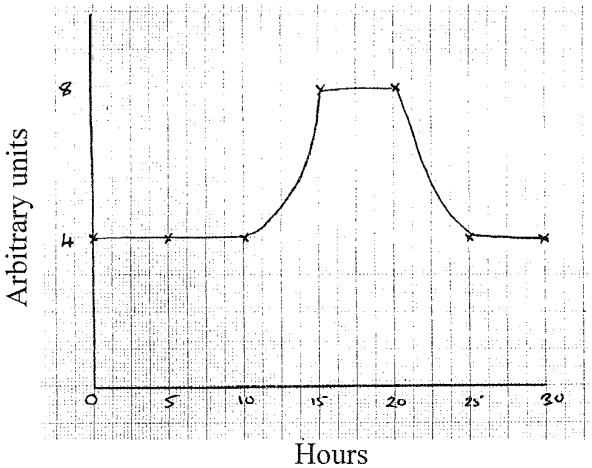
Question	Answers / Explanatory Notes	Marks Available
2	Award a mark for each correct row.	

Feature	*Carbohydrate*	*Lipid*	*Protein*
Can be saturated or unsaturated.		✓	
Contain peptide bonds			✓
Contains the elements carbon, hydrogen and oxygen.	✓	✓	✓
Can contain disulphide bonds.			✓
Cellulose and glycogen are examples.	✓		

3	(a)	Prokaryotic Eukaryotic	2
	(b)	A = Mesosome B = Chromosome / DNA / nucleoid (not: genes) C= Plasmodesmata / cytoplasmic strands / plasmodesmosome	3
	(c)	H is surrounded by a membrane / envelope, B is not. / H is surrounded by a double membrane, B is not. / H contains chromatin, B does not / H contains histones, B does not. / The DNA in B lies free in the cytoplasm, in H the DNA is not free. / Circular chromosome / H has a nucleolus, B does not. (not: not definite nucleus)	1
	(d)	D = Photosynthesis / Conversion of light energy into chemical energy. (Accept trapping light energy.) E = Secretion / secretion of glycoprotein / secretion of protein / synthesis of steroids / making lysosomes / secretory vesicles / adding lipid to protein for export / add carbohydrate to protein for export. Packaging / transport qualified. F = Protein synthesis / Place for ribosome attachment / Transport system. G = ATP production / Energy production . (Accept respiration)	4 [10]

Question		Answers / Explanatory Notes	Marks Available
4	(a) (i)	(Structural) isomers	1
	(ii)	Reference to the fact that the OH and the H are reversed on carbon 1.	1
	(b)	Accept any ring drawn that removes 2 H s and an O, i.e. shows the removal of water. From Carbon 1 on the alpha glucose and carbon 4 on the beta glucose.	1
	(c)	Covalent / glycosidic	1
	(d)	Disaccharide allow: maltose	1
	(e)	Any two from the following: - Starch is made from alpha glucose molecules, or cellulose is made from beta glucose molecules. - Glucose can be added or removed easily from starch. - Cellulose is a very stable molecule due to cross-linkages between adjoining chains. - In starch, all units are the same way up, in cellulose they alternate. - Starch forms granular structures, cellulose forms fibrous structures. - Starch is branched, cellulose is not. - Starch has amylose and amylopectin. (not: ref to size / strength of bonds)	2
	(f) (i)	Starch – Storage molecule (In plants) / long term energy store.	1
	(ii)	Cellulose – Needed for plant cell walls. (Candidates must make it clear which molecule they are referring to if they do not mention both.)	1 [9]

Question		Answers / Explanatory Notes	Marks Available
5	(a)	Immobilised enzymes are enzymes that are enmeshed in / attached to an (inert) solid support / Enzymes stabilised on a (gel) membrane / (Accept enzymes in alginate beads.)	1
	(b)	The substrate / glucose is turned into a product. The glucose attaches to the enzyme (and product is formed.) / reference to an active site	2
	(c)	Glucose oxidase electrode detects the glucose / Transduction into electrical impulses / The current produced can be read on the scale / The product causes a change in the potential difference which is measured by an electrode.	1
	(d) (i)	To regulate / maintain pH / enzymes can only work at a specific pH.	1
	(ii)	Temperatiure	1
	(e)	 Y anywhere except inside	2
	(f)	X – Similar shape to that of the normal substrate and so it fits into and blocks the active site. (not: competes unqualified.) Y – Binds to the enzyme outside of the active site and changes the shape of the enzyme / active site / precipitate the protein.	2
	(g)	Malonate / malonic acid / antibiotics / sulphonamide drugs.	1 [11]

Question		Answers / Explanatory Notes	Marks Available
6	(a) (i)	1 = Anaphase	
	(ii)	2 = Telophase	
	(iii)	3 = Prophase	
	(iv)	4 = Metaphase	4
	(b)	3 4 1 2 Accept Prophase, Metaphase, Anaphase, Telophase.	1
	(c)	Mitosis produces identical daughter cells. /Daughter cells contain the same number of chromosomes as parent. No pairing of homologous chromosomes / No bivalents. No chiasmata / No crossing over. Only one division. Mitosis produces 2 daughter cells, meiosis produces 4. Meiosis for sexual reproduction / makes gametes.	2
	(d) (i)	<u>Plotting the graph -</u> Plotting the axes; Time – linear scale, with units, labelled. DNA – linear scale, with units, labelled. Minus 1 if not all paper used. Minus 1 if axes transposed. Correct plots; all correct ± ½ square. Sample of possible answer  	1 1 1
	(ii)	Replication of DNA. (not: reproduced / duplicates / copies) DNA value doubles, then DNA value halves / returns to original level. (Cell divides) by cytokinesis / cytoplasmic cleavage.	1 1 1 [13]

Question		Answers / Explanatory Notes	Marks Available
7	(a)	A restriction enzyme / (restriction) endonuclease. (not: specific example)	
		B DNA Ligase	1
	(b)	To give matching / the same (sticky) ends; so that the vector / plasmid can join with the fragment; Complimentary bases. (not: codon) (Any two)	2
	(b)	Anneals / seals / splices sticky ends together / Accept bonds DNA fragment to the vector DNA.	1
	(c)	Recombinant (DNA Molecule).	1
	(d)	Can be cut directly from host DNA / use of restriction enzymes	1
		RNA can be extracted / use of messenger RNA and treated with reverse transcriptase which turns RNA into DNA Reverse transcriptase and a description of the process.	2
	(f)	Antibiotic resistance gene / sequences / (radioactive) marker genes.	1
	(g)	Insulin production / production of factor viii / interferon production / human growth hormone production (not: liposomes / cystic fibrosis treatment)	1
			[11]

Question	Answers / Explanatory Notes	Marks Available
8 (a)	A – Biological catalysts that speed up the rate of reactions. B – Lower the activation energy of a reaction. C – (Very) specific due to tertiary / globular structure of protein. D – Description of lock and key. Accept labelled diagram. E – Formation of enzyme substrate complex. Accept labelled diagram. F – Importance of active site. G – Description of the induced fit theory. H – pH alters structures / activity / work at optimum pH (not: denatures) I – An increase in the concentration of substrate increases the rate of reaction, or converse. J – An increase in the concentration of enzyme increases the rate of reaction, or converse. K – Hydrogen bonds, disulphide bonds, van der Waals' forces Any 2 from 3 L – Enzymes can be used again as they are not affected by the reaction / are unchanged at the end of the reaction. M – Enzymes can be denatured by high temperature as it changes the shape of the active site. (A maximum of 10 marks can be awarded from the 14 available.)	[10]

Question	Answers / Explanatory Notes	Marks Available
(b)	A – (DNA) is a polymer of many nucleotides. Accept a description of chains or strands of nucleotides. B – (Each nucleotide) contains the 5-carbon / pentose deoxyribose sugar. C – There is also a phosphate (in each nucleotide). D – It contains the bases thymine, cytosine, adenine and guanine. (not: TCAG, if one base is missing or incorrect or if more than 4 bases are listed.) E – (Nucleotides) are either purines or pyrimidines with correct examples. F – DNA consists of 2 chains of nucleotides twisted helically / Accept diagram / DNA is a double helix. G – Complementary bases are linked by hydrogen bonds. H - A–T and G-C. I – There are free nucleotides in the nucleus J – To replicate the double helix unwinds. K – The 2 strands of DNA unzip as the hydrogen bonds between the bases break. L – The enzyme DNA polymerase catalyses with the reaction. M – (Free) nucleotides pair up with the bases to form a new polymer / strand. N – Replication is semi-conservative. (A maximum of 10 marks can be awarded form the 14 available).	[10]

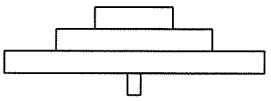
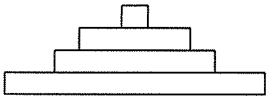
ADVANCED SUBSIDIARY / ADVANCED GCE

BIOLOGY

ASSESSMENT UNIT BI 2

JUNE 2001

Question		Answers / Explanatory Notes	Marks Available
1.	(a)	Cuticle.	1
	(b)	Transpiration. (allow: evaporation)	1
	(c)	Left atrium.	1
	(d)	The Sun / sunlight / sun's energy (not: light)	
	(e)	Succession / primary succession (not: colonisation)	1
	(f)	Insecticides / pyrethroids / organophosphates. (not: pesticides / trade names)	1 [6]

Question	Answers / Explanatory Notes	Marks Available
2. (a) (i)	Fungi. (not: earthworm)	1
(ii)	Blue tits / weasels / owls.	1
(iii)	Voles.	1
(iv)	Oak trees / herbaceous plants / trees and bushes.	1
(v)	Spiders.	1
(b) (i)		1
(ii)		1
	(i) and (ii) correctly labelled (not: triangles)	
(c) (i)	Some light energy is reflected / only blue and red is absorbed / transmission / not striking chloroplast / some used for evaporation.	1
(ii)	Some of Gross Production is used in Respiration / NP = GP – R / similar. (Mention of gross and net must be made)	1
(iii)	Made into inedible / indigestable wood / leaves which fall off / inaccessible parts eg: roots (not: ref to respiration)	1
	It then gets passed to decomposers.	1
(d) (i)	Severe weather / extremely cold winter / very dry summer / fire / drought /climate change / toxic chemicals /flood / habitat destruction qualified (not: natural disaster).	1
(ii)	Reduced no. of weasels; therefore less predation; less competition for food / nests / mates / more food / less disease / more space. (Any 2).	2
		[14]

Question		Answers / Explanatory Notes	Marks Available
3.	(a)	Light increases pore size.	1
	(b) (i)	Graph – axes; (pore size horizontal, transp, rate vertical, suitable scale, correctly labelled.) (One mark each axis) Minus 1 if axis transposed; minus 1 if units missing from both axis / at least half each used (not: if extra grid drawn)	2
		Graph-points plotted accurately – 1 mark for each axis	2
		Drawing of curves labelled with air speed / legend / key. (not: if extrapolated)	1
	(ii)	It will increase(transpiration rate.)	1
	(iii)	At low air speeds a layer of saturated air reduces water potential gradient between inside and outside / reverse argument / at faster air speed evaporation is faster / water molecules removed more quickly / increases diffusion or concentration gradient.	1
	(c) (i)	The rate will increase at first; it will level out (at its maximum) and remain thus until dusk / dark / specified time it will decrease (over the next hour / 2 hours;) it will continue at this low level until dawn / day light / specified time. quantitative relationship ref. to any stage 1 mark for each point. Four from five	4
	(ii)	Temperature and humidity – 1 mark each.	2
	(iii)	Second plant kept in dark / covered / constant light	1 [15]

Question	Answers / Explanatory Notes	Marks Available
4. (a) (i)	Red blood cells / erythrocytes (allow haemoglobin)	1
(ii)	Plasma (not: red blood cells)	1
(b)	Sigmoid has higher percentage saturation than straight line; making Hb more efficient at loading oxygen in the lungs / easier to saturate	2
(c) (i)	Bohr effect / shift.	1
(ii)	CO_2 levels are elevated in respiring tissues; Hb will therefore have lower affinity for oxygen / greater affinity for CO_2 making Hb more efficient at unloading oxygen. Any 2.	2
(d) (i)	S shaped and to the left of given curve (end point must coincide with adult curve)	1
(ii)	Fetal Hb has higher affinity for oxygen than adult Hb / fully saturated at lower oxygen tension. oxygen will therefore always move from the mother's blood to the fetus's blood.	2 [10]
5. (a)	(Upland) peat bog.	1
(b) (i)	Silt / soil (from drainage ditches) will wash into streams etc.; making water cloudy / turbid / will change substrate.	2
(ii)	Will cause increased growth of algae / plants / microbes rotting extra plant / eutrophication /excess fertilisers leach into rivers. reduces oxygen in water	2
(iii)	Trees sprayed with insecticide which is washed / gets into streams etc; bioaccumulation water will contain toxic / harmful / poisonous chemicals.	2
(iv)	Water in ditches made acidic by acid rain, these empty into streams etc.; this lowers the pH of streams etc. / makes them more acidic.	2

Question		Answers / Explanatory Notes	Marks Available
	(c)	(Natural / terrestial) vegetation will absorb fertiliser / used by the plants as the water trickles over it (so that less gets into watercourses) there will be less eutrophication / oxygen levels will be less depleted.	2
	(d) (i)	Biological control / description e.g. introduce predators	1
	(ii)	Difficulty in finding suitable predator / impact of predator on non pest species / expertise is expensive / slow / takes time to establish / incomplete eradication (not: unknown effect of predator)	1 [13]
6	(a)(i)	Alveoli	1
	(ii)	Bronchiole	1
	(iii)	Emphysema	1
	(b) (i)	The total surface area for gas exchange is less in emphysema / reverse; Less molecules of oxygen / carbon dioxide / gases can diffuse at any one time.(ie: rate of diffusion) (not: takes longer unqualified)	2
	(ii)	Blood vessels are further from surface; (allow: red blood cells are farther from the surface / vessels are wider) (not: fewer blood vessels) The distance for diffusion is increased. (not: surface area)	2 [7]

Question	Answers / Explanatory Notes	Marks Available
7 (a)(i)	Diagram of leaf should show six of:: - cuticle; - epidermis; - palisade cells / layer; - spongy mesophyll / layer; - guard cells; - stoma / stomata ; - midrib ; - vascular bundle / vein / xylem and phloem - (substomatal) air space. Award marks for correctly labelled structures as follows: 6 or more -3 marks 4 or 5 -2 marks 3, 2 or 1 -1 mark Award 1 mark for accurately drawn diagram and labels which must touch or clearly indicate structure / layer	4
(ii)	Functions of: cuticle - waterproofing / preventing invasion by microbes /protection qualified epidermis - prevents mechanical damage / invasion by microbes / secretes cuticle; palisade - main site of photosynthesis; spongy - water and / or gas exchange guard cells - open / close stomata; midrib /vein / vascular bundle - transport of water/ minerals in xylem; - transportation of products of photosynthesis in phloem Stomata - entry and exit of gases / water vapour Air space - water and / or gas exchange / gas movement. Award 1 mark for each correct function up to max. 6	6

Question	Answers / Explanatory Notes	Marks Available
(b)(i)	Diagram of respiratory system should show six of: -epiglottis; -trachea; -bronchus; -bronchioles; -alveoli; -pleural membranes; - ribs; -intercostal muscles; -diaphragm. Award marks for correctly labelled structures as follows: 6 or more - 3 marks 4 or 5 - 2 marks 3, 2 or 1 - 1 mark; Award 1 mark for accurately drawn diagram.	4
(ii)	Functions of: epiglottis - covers opening to airways when food is swallowed trachea - strengthened by rings of cartilage to keep airway open. bronchus - to carry air to and from each lung /in connection with trachea, bronchus or bronchioles bronchioles - small passageways to alveoli; - reference to cilia / goblet cells and cleaning function in connection with trachea, bronchus, or bronchioles; alveoli - form respiratory surface - reference to properties of a respiratory surface; ribs and intercostal muscles - alter size of chest to bring about volume / pressure changes; diaphragm - alters size of chest to bring about volume / pressure changes; pleural membranes - reduces friction Award 1 mark for each correct function up to max. 6	6 [10]